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EXAMINER	
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2129	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/644,378	FRY ET AL.	
	Examiner	Art Unit	
	PETER COUGHLAN	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 January 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *18-25 and 27-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *18-25 and 27-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *8/20/2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. This office action is in response to an AMENDMENT entered January 14, 2009 for the patent application 10/644378 filed on August 20, 2003.

2. All previous Office Actions are fully incorporated into this Final Office Action by reference.

3. Examiner's Comment: Although, the terms 'carrier wave' or 'carrier signal' is not specifically mentioned within the specification, the Examiner will exclude these interpretations wherein the context of 'media' is disclosed.

Status of Claims

4. Claims 1-17, 26, 30-40 are cancelled.

Claims 18-25, 27-29 are pending.

35 USC § 101

5. 35 U.S.C. 101 reads as follows:
Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement

thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 18-25, 27-29 are rejected under 35 U.S.C. 101 for nonstatutory subject matter. The computer system must set forth a practical application of that § 101 judicial exception to produce a real-world result. Benson, 409 U.S. at 71-72, 175 USPQ at 676-77. The invention is ineligible because it does not produce a tangible result. A method for developing failure prediction software for a storage system has no tangible result.

The invention fails to specify a practical application by either:

1) specify transforming (physical thing) or

2) having the FINAL RESULT (not the steps) achieve or produce a

useful (specific, substantial, AND credible),

concrete (substantially repeatable/ non-unpredictable), AND

tangible (real world/ non-abstract) result.

A claim that is so broad that it reads on both statutory and non-statutory subject matter, must be amended.

There must be a tangible result that is supported by the disclosure.

However, the portions of the opinions in State Street and AT&T relying solely on a "useful, concrete and tangible" result analysis *should no longer be relied on*. Ex parte Bilski, Appeal No. 2007-1130 (Fed. Cir. October 30, 2008. This court case decision did not state a tangible result was no longer needed.

The court has said that there's a two-pronged test to determine whether a software of method process patent is valid: (1) it is tied to a particular machine or

apparatus, or (2) it transforms a particular article into a different state or thing. In other words, pure software or business method patents that are neither tied to a specific machine nor change something into a different state are not patentable.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 18 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowles in view of Hughes in view of Monsef in view of Wavish. ('Application of Fuzzy Logic to Reliability Engineering', referred to as **Bowles**; 'Improved Disk Drive Failure Warnings', referred to as **Hughes**; 'Fuzzy rule-based expert system for power system fault diagnosis, referred to as **Monsef**; 'U. S. Patent 5832467', referred to as **Wavish**)

Claim 18

Bowles teaches assisting a user in generating a failure prediction algorithm (**Bowles,** abstract; 'Failure prediction algorithm' of applicant is equivalent to 'analysis of system structures, fault trees, event trees, the reliability of degradable systems, and the

assessment of system criticality based on the severity of a failure and its probability of occurrence' of Bowles.) comprising fuzzy logic rules, the failure prediction algorithm stored in a natural language format **(Bowles,** p448, C2, p435 C2:20 through p436 C1:14; 'Fuzzy logic rules' of applicant is equivalent to 'fuzzy logic' of Bowles. 'Natural language format' of applicant is equivalent to 'natural language expressions' of Bowles.)

Bowles fails to particular call for generating machine-readable code from the stored failure prediction algorithm in response to user input.

Hughes teaches generating machine-readable code from the stored failure prediction algorithm in response to user input **(Hughes,** p350, C2:35 through P351, C1:4; The ability to 'generate machine readable code' of applicant is equivalent to running the 'SMART' application of Hughes.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Bowles by being able to run the invention on a computer as taught by --- (name of prior art) to generating machine-readable code from the stored failure prediction algorithm in response to user input.

For the purpose of increasing the speed of output.

Bowles and Hughes fails to particular call testing the machine-readable code with sample data to produce a result in response to user input.

Monsef teaches testing the machine-readable code with sample data to produce a result in response to user input. **(Monsef,** p186 C2:26-36; 'Testing ... with sample data to produce a result' of applicant is equivalent to 'simulation' of Monsef.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's

invention to modify the combined teachings of Bowles and Hughes by running simulations as taught by Monsef to testing the machine-readable code with sample data to produce a result in response to user input.

For the purpose of testing the invention to determine if it performs as desired.

Bowles and Hughes fails to particular call selectively revising the failure prediction algorithm in response to user input such that the result corresponds to an expected result.

Wavish and Monsef teach selectively revising the failure prediction algorithm in response to user input such that the result corresponds to **(Wavish,** C9:54-67, C2:5-26; 'Selectively revising' a 'prediction algorithm' of applicant is equivalent to 'selectively modify ... until a level of accuracy in accordance with said predetermined criteria' of Wavish.) an expected result. **(Monsef,** p186 C2:26-36; 'Expected result' of applicant is equivalent to 'actual information' of Monsef.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Bowles and Hughes by modifying the algorithm to match corresponding outcomes as taught by Wavish and Monsef to selectively revising the failure prediction algorithm in response to user input such that the result corresponds to an expected result.

For the purpose of having an adaptable invention for various input parameters.

Claim 22

Bowles fails to particular call the machine-readable code is configured to execute on a storage system.

Hughes teaches the machine-readable code is configured to execute on a storage system. (**Hughes,** abstract; 'Machine readable code' of applicant is equivalent to the application SMART of Hughes. 'Execute on a storage system' of applicant is disclosed by 'disk drive failure prediction' of Hughes.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Hughes by being able to run on a computer as taught by Hughes to have the machine-readable code is configured to execute on a storage system.

For the purpose of increasing the speed of output.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 25, 28, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Bowles, Hughes, Monsef and Wavish in view of Kanagawa.

('Fixed Time Life Tests Based On Fuzzy Life Characteristics', referred to as '**Kanagawa**)

Claim 25

Bowles, Hughes, Monsef and Wavish fails to particular call gathering performance data for a storage system executing a failure prediction algorithm on the performance data to produce a result, the failure prediction algorithm comprising fuzzy logic rules tuning the failure prediction algorithm by adjusting a fuzzy variable definition. Kanagawa teaches gathering performance data for a storage system (**Kanagawa,** p317, C2:7-16; 'Gathering performance data' of applicant is illustrated by the ability to have 'n items be drawn at random' of Kanagawa.) executing a failure prediction algorithm on the performance data to produce a result, the failure prediction algorithm comprising fuzzy logic rules tuning the failure prediction algorithm by adjusting a fuzzy variable definition. (**Kanagawa,** p318, C1:20 through p319, C1:20, p317, C1:14-27; 'Failure prediction algorithm' of applicant is equivalent to 'reliability demonstration test' of Kanagawa. 'Fuzzy logic rules' of applicant is equivalent to fuzzy theory' of Kanagawa. 'Adjusting' of applicant is disclosed by the fact that 'the coefficients a_{ij} must be chosen so that the membership functions are continuous' of Kanagawa.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Bowles, Hughes, Monsef and Wavish by getting information input and running an algorithm with said input and being able to adjust the output as taught by Kanagawa to gathering performance data for a storage system

executing a failure prediction algorithm on the performance data to produce a result, the failure prediction algorithm comprising fuzzy logic rules tuning the failure prediction algorithm by adjusting a fuzzy variable definition.

For the purpose of using fuzzy logic for prediction purposes.

Bowles fails to particular call selectively forecasting failure of one or more components of the storage system in response to the result.

Hughes teaches selectively forecasting failure of one or more components of the storage system in response to the result. **(Hughes,** abstract; 'forecasting failure' of a storage system' of applicant is disclosed by 'disk drive failure prediction' of Hughes.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Bowles by predicting failure as taught by Hughes to selectively forecasting failure of one or more components of the storage system in response to the result.

For the purpose of avoiding lost information and associated costs.

Claim 28

Bowles fails to particular call producing a notification in response to the result.

Hughes teaches producing a notification in response to the result. **(Hughes,** p351, C1:40 to C2:4; 'Notification' of applicant is illustrated by the result 'won't-fail/will fail' of Hughes.) It would have been obvious to a person having ordinary skill in the art at

the time of applicant's invention to modify the teachings of Bowles by producing a result as taught by Hughes to producing a notification in response to the result.

For the purpose of outputting a result to a user who can act appropriately.

Claim 29

Bowles, Hughes, Monsef and Wavish fails to particular call pre-processing performance data to provide input data for the failure prediction algorithm. Kanagawa teaches pre-processing performance data to provide input data for the failure prediction algorithm. (**Kanagawa,** p317, C2:7-16; 'Pre-processor configured to preprocess performance data' of applicant is illustrated by the ability to have 'n items be drawn at random' of Kanagawa.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Bowles, Hughes, Monsef and Wavish by reducing input amounts as taught by Kanagawa to pre-processing performance data to provide input data for the failure prediction algorithm.

For the purpose of getting a rough input value by taking a sample instead of all input values speeds output time and lowers computational costs.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 19, 20, 24, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Bowles, Hughes, Monsef, Wavish and Kanagawa in view of Cox. ('Fuzzy Fundamentals', referred to as **Cox**)

Claim 19

Bowles, Hughes, Monsef, Wavish and Kanagawa fails to particular call the fuzzy logic rules comprise linguistic variables having less than four terms.

Cox teaches the fuzzy logic rules comprise linguistic variables having less than four terms. (**Cox**, p58, C2:14-24; 'Less than four terms' of applicant is illustrated by the examples of the variables of 'warm' and 'not very fast' of Cox.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Bowles, Hughes, Monsef, Wavish and Kanagawa by using three input variables as taught by Cox to have the fuzzy logic rules comprise linguistic variables having less than four terms.

For the purpose of lower computational costs and ease of programming.

Claim 20

Bowles, Hughes, Monsef, Wavish and Kanagawa fail to particular call wherein certain linguistic variables comprise less than three terms.

Cox teaches wherein certain linguistic variables comprise less than three terms. (**Cox,** p58, C2:14-24; 'Less than three terms' of applicant is illustrated by the examples of the variables of 'warm' and 'not very fast' of Cox.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Bowles, Hughes, Monsef, Wavish and Kanagawa by using two input variables as taught by Cox to have wherein certain linguistic variables comprise less than three terms.

For the purpose of lower computational costs and ease of programming of that of three variables.

Claim 24

Bowles, Hughes, Monsef, Wavish and Kanagawa fails to particular call the fuzzy logic rules are defined by conditional statements that include subjects, adjectives, and verbs familiar to personnel in the storage system field.

Cox teaches the fuzzy logic rules are defined by conditional statements (**Cox,** p58, C2:14-24; 'Conditional statements' of applicant is illustrated by the examples of 'if' and 'and' of Cox.) that include subjects, adjectives, and verbs familiar to personnel in the storage system field. (**Cox,** p58, C2:14-24; 'Subjects, adjectives and verbs' of applicant

is illustrated by the example 'brake temperature is warm', 'speed is not very fast, and 'brake pressure is slightly decreased' of Cox.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Bowles, Hughes, Monsef, Wavish and Kanagawa by using natural language script as taught by Cox to have the fuzzy logic rules are defined by conditional statements that include subjects, adjectives, and verbs familiar to personnel in the storage system field.

For the purpose of ease of programming and understanding of code.

Claim 27

Bowles, Hughes, Monsef, Wavish and Kanagawa fails to particular call mapping the result to one of a plurality of predefined recommendations.

Cox teaches mapping the result to one of a plurality of predefined recommendations. (**Cox,** p60, C1:8-15; Examples of 'predefined recommendations' of applicant is equivalent to 'throttle action is (PL or PM or ZR or NM)' of Cox.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Bowles, Hughes, Monsef, Wavish and Kanagawa by using fuzzy outputs as taught by Cox to mapping the result to one of a plurality of predefined recommendations.

For the purpose of ease of implementation of the results of fuzzy logic.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Bowles, Hughes, Monsef and Wavish in view of Vaneck. ('Fuzzy guidance controller for an autonomous boat', referred to as **Vaneck**)

Claim 21

Bowles, Hughes, Monsef and Wavish fails to particular call tuning the failure prediction algorithm by adjusting a fuzzy variable definition.

Vaneck teaches tuning the failure prediction algorithm by adjusting a fuzzy variable definition. (**Vaneck,** p46, C1:16 through p47, C1:6; 'Tuning' by 'adjusting a fuzzy variable condition' of applicant is equivalent to 'if a different response is desired for a particular range of input variables, then only a few FAM rules would need to be altered' of Vaneck.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Bowles,

Hughes, Monsef and Wavish by adjusting the algorithm as taught by Vaneck to tuning the failure prediction algorithm by adjusting a fuzzy variable definition.

For the purpose of having the data conform to the prediction model.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Bowles, Hughes, Monsef and Wavish in view of Andrade. ('A layer based computational model plus a data base structure as a framework to build parallel fuzzy controllers', referred to as **Andrade)**

Claim 23

Bowles, Hughes, Monsef and Wavish fails to particular call revising the failure prediction algorithm by way of a text editor.

Andrade teaches revising the failure prediction algorithm by way of a text editor. (**Andrade,** p165, C2:34 through p166, C1:7; 'Text editor' of applicant is equivalent to 'general text editor' of Andrade.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Bowles, Hughes, Monsef and Wavish by using a word processor as taught by Andrade to have revising the failure prediction algorithm by way of a text editor.

For the purpose of using a word processor to edit rules which are already in a natural language form lowers learning costs of rule modification.

Response to Arguments

6. Applicant's arguments filed on January 14, 2009 for claims 18-25, 27-29 have been fully considered but are not persuasive.

7. In reference to the Applicant's argument:

REMARKS

STATUS OF THE CLAIMS

Claims 18-25 and 27-29 remain in the case. Claims 18-25 and 27-29 stand rejected. No new claims have been added. No new matter has been added. Claims 1-17, 26, and 30-40 have been cancelled. Applicants respectfully traverse the rejections of Claims 18-25 and 27-29.

PROPRIETY OF FINAL REJECTION UNDER MPEP § 706.07(a)

The Office Action states that "Applicant's amendment necessitated the new grounds of rejection presented in this Office Action. Accordingly, this action is made final." (Office Action, pg. 28, ~ 15). Applicants, however, respectfully submit that a final rejection is improper under MPEP § 706.07(a) because the new grounds of rejection were not necessitated by Applicants' amendment.

MPEP § 706.07(a) states that "second or any subsequent actions on the merits shall be final, except where the examiner introduces a new ground of rejection that is neither necessitated by applicant's amendment of the claims, nor based on information submitted in an information disclosure statement filed during the period." (emphasis added).

In Applicants response to the Office Action mailed February 4, 2008 (hereinafter "previous Office Action"), Applicants amended only Claim 18, leaving claims 19-25 and 27-29 as originally or previously presented. The Office Action introduced several new grounds of rejection, including 35 U.S.C. § 103(a) rejections based on the newly introduced art Bowles and Monsef. Because Applicants did not amend independent Claim 25 and dependent Claims 27-29, Applicants submit that it is improper to give them a final rejection, because the new grounds of rejection are clearly not necessitated by an amendment, as Applicants did not amend Claims 25 or Claims 27-29. Applicants respectfully request that the status of the rejection be changed from final to non-final, to allow Applicants to respond to the new grounds of rejection based on new art, or alternatively that the new grounds of rejection be removed and that the claims at issue be allowed.

Examiner's response:

The applicant altered the claims dated 6/4/2008 which altered the scope of the claims. The final rejection was proper.

8. In reference to the Applicant's argument:

RESPONSE TO CLAIM REJECTIONS UNDER 35 U.S.C. § 103(a)

Claims 18-25, and 27-40 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over "Application of Fuzzy Logic to Reliability Engineering" (hereinafter Bowles), in view of "Improved Disk Drive Failure Warnings" (hereinafter Hughes),

"Fuzzy Rule-based Expert System for Power System Fault Diagnosis" (hereinafter Monsef), U.S. Patent No. 5,832,467 to Wavish (hereinafter Wavish), "Fixed Time Life Tests Based on Fuzzy Life Characteristics" (hereinafter Kanagawa), "Fuzzy Fundamentals" (hereinafter Cox), "Fuzzy Guidance Controller for an Autonomous Boat" (hereinafter Vaneck), and/or "A Layer Based Computational Model Plus a Database Structure as a Framework to Build Parallel Fuzzy Controllers" (hereinafter Andrade).

Graham v. John Deere Co., 383 US 1,148 USPQ 459 (1966) sets forth the factual inquiry necessary to determine obviousness. To make a primafacie case of obviousness, one must: determine the scope and contents of the prior art; determine the differences between the prior art and the claims at issue; resolve the level of ordinary skill in the pertinent art; and consider objective evidence present in the application indicative of obviousness or nonobviousness.

Applicants respectfully assert that the claims at issue are not obvious. First, not all elements of the amended claims are taught or suggested in the art of record, and second, the art of record comes from vastly different fields than does the Applicants' claimed invention and is clearly nonanalogous art. Applicants respectfully submit that Bowles, Hughes, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade fails to particular call assisting a user in generating a failure prediction algorithm comprising fuzzy logic rules, generating machine-readable code from the stored failure prediction algorithm, testing the machine-readable code with sample data to produce a result, or selectively revising the failure prediction algorithm such that the result corresponds to an expected result.. Applicants further submit that Bowles, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade are nonanalogous art, and that these differences between the prior art and the claims at issue render the claims at issue nonobvious and allowable under 35 U.S.C. § 103(a).

To highlight the differences between the present invention and the cited prior art, as mandated by Graham, a summary of the claimed invention and of the prior art may be useful. Generally, the claimed invention seeks to overcome problems of the prior art associated with the maintenance and storage of data within a storage system and with the development of failure prediction software for the storage system. (Specification, ~[[0001]).

Independent Claim 18 specifically requires "assisting a user in generating a failure prediction algorithm comprising fuzzy logic rules, the failure prediction algorithm stored in a natural language format; generating machine-readable code from the stored failure prediction algorithm in response to user input; testing the machine-readable code with sample data to produce a result in response to user input; and selectively revising the failure prediction algorithm in response to user input such that the result corresponds to an expected result."

Independent Claim 25 specifically requires "gathering performance data for a storage

system; executing a failure prediction algorithm on the performance data to produce a result, the failure prediction algorithm comprising fuzzy logic rules; tuning the failure prediction algorithm by adjusting a fuzzy variable definition; and selectively forecasting failure of one or more components of the storage system in response to the result."

Examiner's response:

The Bowles title is 'Application of fuzzy logic to reliable engineering', the Monsef article is titled 'Fuzzy rule based expert system for power system diagnosis, and the Hughes article is titled 'Improved disk drive failure warnings.' All three of these articles are related to the application at hand,

9. In reference to the Applicant's argument:

Summary of Bowles

Bowles describes several models for characterizing system reliability using fuzzy arithmetic. (Bowles, Abstract). Bowles uses general examples, such as "Hans ate v eggs for breakfast," focusing on the mechanics of fuzzy arithmetic instead of specific applications. (Bowles, pg. 438, ~ 5). Two specific areas of art mentioned in Bowles are the nuclear and aerospace industries. (Bowles, pg. 442, ~[6).

Bowles does not address failure prediction algorithms, addressing instead general system reliability and the general probability of events. (Bowles, Abstract; Bowles, pg. 439, col. 2). Bowles further does not teach a method for assisting a user in generating a failure prediction algorithm comprising fuzzy logic rules, as required by Claim 18, not mentioning a user or a failure prediction algorithm.

Examiner's response:

Bowles is used to introduce 'Failure prediction algorithm' of applicant is equivalent to 'analysis of system structures, fault trees, event trees, the reliability of degradable systems, and the assessment of system criticality based on the severity of a

failure and its probability of occurrence' of Bowles. (**Bowles,** abstract) 'Fuzzy logic rules' of applicant is equivalent to 'fuzzy logic' of Bowles. 'Natural language format' of applicant is equivalent to 'natural language expressions' of Bowles.) (**Bowles,** p448, C2, p435 C2:20 through p436 C1:14)

10. In reference to the Applicant's argument:

Summary of Hughes

Hughes proposes various algorithms for SMART failure prediction systems to predict failure in disk-drives. (Hughes, Abstract). The algorithms proposed in Hughes are designed to be run on as microprocessor firmware on a disk-drive. (Hughes, Abstract).

The Office Action suggests that "running the 'SMART' application of Hughes" is equivalent to generating machine-readable code from the stored failure prediction algorithm in response to user input as required by Claim 18. (Office Action, Page 4, ~[1).

Applicants respectfully submit that running an application is not equivalent to "generating machine-readable code from the stored failure prediction algorithm" of Claim 18. The microprocessor of Hughes does run the SMART failure warning algorithm, which presumably comprises machine-readable code. This does not necessarily imply that the SMART failure warning algorithm was compiled, as device level microprocessor code is often written directly as machine readable code and not compiled. Even if it was compiled, Hughes does not teach compiling a failure prediction algorithm comprising fuzzy logic rules stored in a natural language format into machine readable code.

In direct contrast to the claims at issue, Hughes teaches that a storage drive itself measures up to 30 failure attributes, and that this technology is "manufacturer proprietary." (Hughes, pg. 351, C1:20-43). Because the technology is proprietary, Hughes does not teach what, if anything is compiled, and clearly does not teach generating machine-readable code from a natural language format failure prediction algorithm comprising fuzzy logic rules. It is more likely that the SMART algorithm is implemented as a combination of hardware sensors and low level instructions, however Hughes expressly states that the implementation of the technology is proprietary, and is thus unknown. Hughes cannot teach something that is unknown. Hughes does not teach, suggest, or even mention compiling, and clearly does not teach generating

machine-readable code from a stored failure prediction algorithm in a natural language format.

Examiner's response:

Hughes is used to introduce the ability to 'generate machine readable code' of applicant is equivalent to running the 'SMART' application of Hughes. (**Hughes,** p350, C2:35 through P351, C1:4)

11. In reference to the Applicant's argument:

Summary of Monsef

Monsef demonstrates a component oriented fuzzy expert system for power system fault diagnosis. (Monsef, Abstract). Monsef teaches the diagnosis of existing faults in a power system by modeling the power system and comparing simulation results with actual system information to diagnose a power system fault. (Monsef, pg. 186, ~[4).

Monsef does not teach testing machine-readable code with sample data to produce a result in response to user input, as required by Claim 18. Applicants respectfully submit that modeling a power system and running a simulation to diagnose an existing power system fault does not read on testing a machine-readable code failure prediction algorithm with sample data to produce a result in response to user input. Monsef does not teach machine-readable code, a failure prediction algorithm, or sample data.

Examiner's response:

Monsef is used to introduce 'testing ... with sample data to produce a result' of applicant is equivalent to 'simulation' of Monsef. **(Monsef,** p186 C2:26-36) and 'expected result' of applicant is equivalent to 'actual information' of Monsef. (**Monsef,** p186 C2:26-36)

12. In reference to the Applicant's argument:

Summary of Wavish

Wavish teaches a rule-based data processing apparatus for optimization of behavioral prediction in Real Time ABLE (RTA) autonomous agents such as robots, artificial intelligences, and the like. (Wavish, col. 1, 11.4-67). Wavish teaches the use of genetic algorithms that generate chromosomal representations. (Wavish, Abstract; Wavish, col. 2, 11.47-51).

Wavish teaches that autonomous agents are defined by a first set of rules and a second set or rules. (Wavish, col. 2, 11.5-26) The second set of rules predicts the agent state changes caused by the first rules. (Id.). The autonomous agent monitors the accuracy of the second set of rules and modifies the second set of rules to increase their accuracy. (Id.).

The autonomous rule modification of Wavish does not read on selectively revising a failure prediction algorithm in response to user input such that the result corresponds to an expected result for several reasons. Wavish does not teach revising a failure prediction algorithm, but instead teaches modifying behavioral rules. Additionally, even if Wavish did teach revising a failure prediction algorithm, Wavish teaches that the autonomous agent modifies the rules itself, in response to its' own monitoring of the rules, not in response to user input. In direct contrast to the present invention, the entire purpose of RTA agents such as robots, artificial intelligences, and similar rule-based systems as described in Wavish is to minimize user interaction and control.

Examiner's response:

Wavish is used to introduce 'selectively revising' a 'prediction algorithm' of applicant is equivalent to 'selectively modify ... until a level of accuracy in accordance with said predetermined criteria' of Wavish. (**Wavish,** C9:54-67, C2:5-26)

13. In reference to the Applicant's argument:

Summary of Kanagawa

Kanagawa teaches calculating the reliability, or mean time between failures (MTBF), of a group by letting a sample from the group run until failure. (Kanagawa, Abstract). Kanagawa then calculates whether the MTBF is acceptable or not using fuzzy logic

sets. (Kanagawa, Abstract; Kanagawa, col. 2, 11. 10-16). The reliability demonstration test of Kanagawa does not use a failure prediction algorithm to predict failure, it lets devices run until they do fail, thereby demonstrating reliability. The reliability demonstration does not involve any prediction, and Kanagawa does not teach failure prediction. Kanagawa teaches the monitoring of failures in "fixed-time life tests," which is fundamentally different than generating a failure prediction algorithm. (Kanagawa, col. 2, 11. 10-16).

The reliability demonstration test of Kanagawa does not use a failure prediction algorithm to predict failure, it lets devices run until they do fail, thereby demonstrating reliability. The reliability demonstration does not involve any prediction, and Kanagawa does not teach failure prediction. Kanagawa teaches the monitoring of failures in "fixed-time life tests," which is fundamentally different than generating a failure prediction algorithm. (Kanagawa, col 2, 11. 10-16).

Applicants further respectfully submit that even if Kanagawa' s reliability demonstration were a failure prediction algorithm, it does not comprise fuzzy logic rules. Kanagawa does teach the use of fuzzy sets in deciding whether or not a lot has an acceptable MTBF. Fuzzy sets are fundamentally different than fuzzy logic rules, and their use in Kanagawa is also different than in Claim 25.

Fuzzy logic rules are logical expressions that operate on fuzzy sets (also known as fuzzy variables) to produce an output, much as an algebraic expression operates on a variable. See paragraphs [0052] and [0102]-[0118] of the Specification for a detailed description of fuzzy logic rules and fuzzy logic sets/variables. Kanagawa teaches the use of fuzzy logic sets in determining whether a group of devices is acceptable. Applicants submit, however, that Kanagawa does not teach fuzzy logic rules, and clearly does not teach a failure prediction algorithm that comprises fuzzy logic rules. Kanagawa's fuzzy logic sets are not fuzzy logic rules, are not stored in a natural language format, and do not predict failure.

The Office Action also suggests that Kanagawa teaches the "gathering performance data for a storage system" of Claim 25 with "the ability to have 'n items be drawn at random.'" (Office Action, pg. 7, ~[1; Kanagawa, col. 2, 11.7-16). The n items of Kanagawa are a sample of a group or "lot." (Kanagawa, col. 2, lh 7-16). Selecting a random sample of items from a lot is clearly not gathering performance data for a storage system. Kanagawa does not teach a storage system, or gathering performance data for that storage system.

The Office Action further suggests that Kanagawa teaches "executing a failure prediction algorithm on the performance data to produce a result, the failure prediction algorithm comprising fuzzy logic rules. (Office Action, pg. 7, ~[1). As discussed above, Kanagawa lacks a failure prediction algorithm comprising fuzzy logic rules. Applicants further submit that Kanagawa does not teach executing a failure prediction algorithm on

performance data to produce a result. Applicants respectfully submit that Kanagawa does not teach a failure prediction algorithm and further that Kanagawa does not teach executing anything.

The Office Action also suggests that Kanagawa' s teaching that "the coefficients aij must be chosen so that the membership functions are continuous" is equivalent to "tuning the failure prediction algorithm by adjusting a fuzzy variable definition" of Claim 25. (Office Action, pg. 7, ~[1). Applicants respectfully submit that defining a polynomial membership function as continuous is not equivalent to tuning a failure prediction algorithm by adjusting a fuzzy variable definition. Kanagawa is merely stating the fact that the membership functions (examples of which are illustrated in Kanagawa's Table 1 on page 319) must be continuous. Even if this could be construed as a fuzzy variable definition, Kanagawa does not adjust the definition (it "must" be continuous), and clearly does not tune a failure prediction algorithm. At most, Kanagawa defines a membership function for an acceptability decision, but clearly does not tune a failure prediction algorithm by adjusting a fuzzy variable definition.

Examiner's response:

Kanagawa is used in combination with the other references. Kanagawa is used to introduce 'gathering performance data' of applicant is illustrated by the ability to have 'n items be drawn at random' of Kanagawa. **(Kanagawa,** p317, C2:7-16), 'Failure prediction algorithm' of applicant is equivalent to 'reliability demonstration test' of Kanagawa. 'Fuzzy logic rules' of applicant is equivalent to fuzzy theory' of Kanagawa. 'Adjusting' of applicant is disclosed by the fact that 'the coefficients a_{ij} must be chosen so that the membership functions are continuous' of Kanagawa. **(Kanagawa,** p318, C1:20 through p319, C1:20, p317, C1:14-27) and 'Pre-processor configured to preprocess performance data' of applicant is illustrated by the ability to have 'n items be drawn at random' of Kanagawa. **(Kanagawa,** p317, C2:7-16)

14. In reference to the Applicant's argument:

Summary of Cox

Cox provides a general description of how fuzzy logic may be used in control systems such as anti-lock braking systems and steam turbines. (Cox, pg. 58, col. 1, ~[4; Cox, pg. 59, col. 1, ~ 2). Cox does not teach fuzzy logic rules comprising linguistic variables having less than four terms. In the example from Cox cited in the Office Action, the variable 'temperature' may have at least six terms "cold, cool, moderate, warm, hot, very hot," not less than four terms or three terms as required by Claims 19 and 20. (Office Action, pg. 10, ~[3; Cox, pg. 58, col. 2, ~[2).

Examiner's response:

Cox is used to introduce 'less than four terms' of applicant is illustrated by the examples of the variables of 'warm' and 'not very fast' of Cox. **(Cox,** p58, C2:14-24) or 'less than three terms' of applicant is illustrated by the examples of the variables of 'warm' and 'not very fast' of Cox. **(Cox,** p58, C2:14-24) In addition, Cox is used to map the elements 'Conditional statements' of applicant is illustrated by the examples of 'if' and 'and' of Cox. **(Cox,** p58, C2:14-24), 'subjects, adjectives and verbs' of applicant is illustrated by the example 'brake temperature is warm', 'speed is not very fast, and 'brake pressure is slightly decreased' of Cox. **(Cox,** p58, C2:14-24) and examples of 'predefined recommendations' of applicant is equivalent to 'throttle action is (PL or PM or ZR or NM)' of Cox. **(Cox,** p60, C1:8-15)

15. In reference to the Applicant's argument:

Summary of Vaneck

Vaneck describes a fuzzy controller used to chart paths for a small autonomous boat prototype vehicle using GPS. (Vaneck, Abstract; Vaneck, pg. 45, ~[3).

Examiner's response:

Vaneck is used in combinations with other references and introduces 'tuning' by 'adjusting a fuzzy variable condition' of applicant is equivalent to 'if a different response is desired for a particular range of input variables, then only a few FAM rules would need to be altered' of Vaneck. **(Vaneck,** p46, C1:16 through p47, C1:6)

16. In reference to the Applicant's argument:

Summary of Andrade

Andrade teaches the use of parallel fuzzy processors in industrial process control. (Andrade, Abstract).

In view of the above described differences between the claimed invention and the art of record under the Graham analysis, Applicants respectfully submit that that the claims at issue are not obvious. First, not all elements of the amended claims are taught or suggested in the art of record, and second, the art of record comes from vastly different fields than does the Applicants' claimed invention and is clearly nonanalogous art. Applicants respectfully submit that Bowles, Hughes, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade do not teach assisting a user in generating a failure prediction algorithm comprising fuzzy logic rules, generating machine- readable code from the stored failure prediction algorithm, testing the machine-readable code with sample data to produce a result, or selectively revising the failure prediction algorithm such that the result corresponds to an expected result.

Applicants further submit that Bowles, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade are nonanalogous art. As quoted in M.P.E.P § 2143, the recent Supreme Court case of KSR v. Teleflex requires that, when determining "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue[,] to facilitate review, this analysis should be made explicit." KSR International Co. v. Teleflex Inc., 550 U.S .....
82 USPQ2d 1385, 1396 (2007). Even if Bowles, Hughes, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade taught each and every element of the claimed invention, the Office Action has made no explicit analysis of why one of skill in the art of storage systems would look to the nonanalogous and disparate fields of the nuclear and

aerospace industries, power systems, RTA autonomous agents, anti-lock braking systems, steam turbines, and small autonomous boats, or why such matter" logically would have commended itself to an inventor' s attention in considering his problem." In re Clay, 966 F.2d 656, 659 (Fed. Cir. 1992).

Examiner's response:

Andrade is used in combination with other references and is used to introduce 'text editor' of applicant is equivalent to 'general text editor' of Andrade. (**Andrade,** p165, C2:34 through p166, C1:7)

17. In reference to the Applicant's argument:

Impermissible Hindsight

Appellants further respectfully submit that if the prior art of record so clearly demonstrates the obviousness of the claimed invention, a single reference would teach more than just one or two elements of the claimed invention. However, the formation of the combinations used in the rejections is indicative of impermissible hindsight analysis by the Examiner. The sheer number of references used from such extreme disparate fields of art seems to indicate that the claim terms were used in a key word search of the prior art, likely for the term "fuzzy logic." For certain claims up to six different references are relied upon, and every rejection relies on at least four different references. Once a key word hit was found, there appears to be little analysis performed to determine the applicability of relevance of the reference. The present group of prior art references is the third such group relied upon, and none of the groups teach each and every element of the claims, or relate remotely to storage devices. Appellants respectfully assert that because such analysis is improper the rejections should be overturned.

Given that Bowles, Hughes, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade fail to teach or suggest all of the elements recited in independent Claims 18 and 25 and further given the other differences between the prior art and the claimed invention, Applicants respectfully submit that independent Claims 18 and 25 are patentable over Bowles, Hughes, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade. Given that dependent Claims 19-24 depend from Claim 18 and that dependent Claims 27-29 depend from Claim 25, Applicants respectfully submit that Claims 19-24 and 27-29 are also patentable over Bowles, Hughes, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade. Applicants respectfully request that the rejection of Claims 18-25 and 27-29

under 35 U.S.C. § 103(a) be withdrawn and that Claims 18-25 and 27-29 be deemed allowable.

Examiner's response:

The Examiner disagrees with this argument. One reason why a number of references are used is to use references which state the claimed invention rather than stating that claim elements are inherent to a reference. Another reason why is due to the simplicity of the claims. 'Less than 4 terms' or 'less than three terms' or using a text editor. Text editors have been around for decades and are often considered common knowledge. The Examiner did use this argument but rather found the claim elements are cited the art .

Examination Considerations

18. The claims and only the claims form the metes and bounds of the invention. "Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, l 45-48; p 2100-9, c 1, l 1-4). The Examiner has the full latitude to interpret each claim in the broadest reasonable sense. Examiner will reference prior art using terminology familiar to one of ordinary skill in the

art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

19. Examiner's Notes are provided to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and sprit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but link to prior art that one of ordinary skill in the art would find inherently appropriate.

20. Examiner's Opinion: Paragraphs 12 and 13 apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

Conclusion

21. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

22. Claims 18-25, 27-29 are rejected.

Correspondence Information

23. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner Peter Coughlan, whose telephone number is (571) 272-5990. The Examiner can be reached on Monday through Friday from 7:15 a.m. to 3:45 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor David Vincent can be reached at (571) 272-3080. Any response to this office action should be mailed to:

Commissioner of Patents and Trademarks,

Washington, D. C. 20231;

Hand delivered to:

Receptionist,

Customer Service Window,

Randolph Building,

401 Dulany Street,

Alexandria, Virginia 22313,

(located on the first floor of the south side of the Randolph Building);

or faxed to:

(571) 272-3150 (for formal communications intended for entry.)

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/P. C./

Examiner, Art Unit 2129

Peter Coughlan

2/23/2009

/David R Vincent/

Supervisory Patent Examiner, Art Unit 2129